

Utilization of Self-Healing Materials in Thermal Protection System Applications

Completed Technology Project (2016 - 2020)



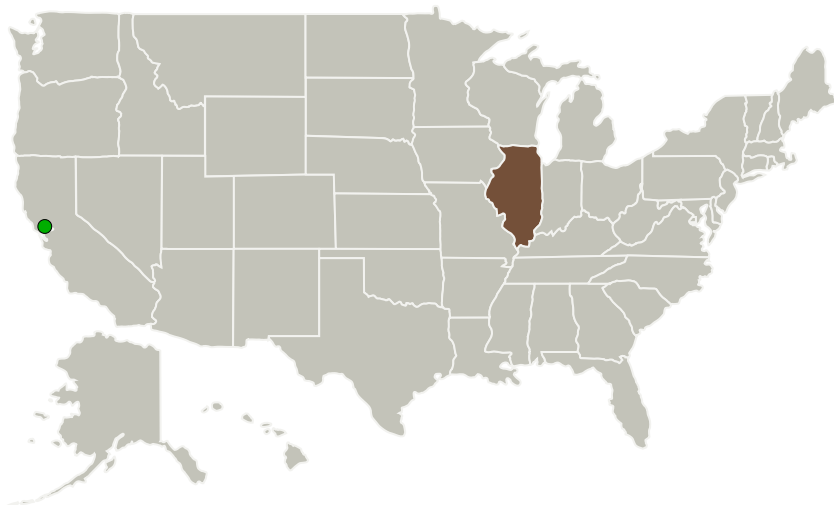
Project Introduction

The proposed project is the Utilization of Self-Healing Materials for Thermal Protection System (TPS) Applications. Currently, the technology for repairing TPS from micro meteor and orbital debris impact damage has a low Technology Readiness Level (TRL) of 2 and there are no repair materials currently available for use. This project plans to raise this TRL by integrating self-healing technology into existing TPS materials. In order to raise the TRL, self-healing TPS needs to be demonstrated at significantly higher temperatures than have been previously demonstrated. The proposed plan for advancing self-healing TPS consists of four stages: manufacturing, thermal testing, self-healing testing, and thermal testing of healed samples. Placing the material in arc jets with relevant reentry environments will test the thermal response of the material. Impacting or damaging the integrated material will test self-healing properties. After performing this research, self-healing TPS will be ready for testing in relevant space environments by measuring material responses in vacuum and at extreme varying temperatures. Visiting NASA centers will make this project successful by allowing access to NASA labs, equipment, and technology experts.

Anticipated Benefits

This project will advance the self-healing material technology utilized in repairing thermal protection systems damaged by micro-meteor and orbital debris impacts.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
University of Illinois at Urbana-Champaign	Lead Organization	Academia	Urbana, Illinois
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations

Illinois

Project Website:

<https://www.nasa.gov/strg#.VQb6T0jJzyE>

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

University of Illinois at Urbana-Champaign

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Zachary R Putnam

Co-Investigator:

Nathaniel L Skolnik

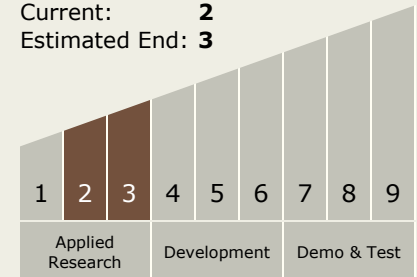
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Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.3 Thermal Protection Components and Systems
 - └ TX14.3.1 Thermal Protection Materials

Target Destinations

Earth, The Moon, Mars